T E C H N I C A L M E M O R A N D U M

Utah Coal Regulatory Program

June 27, 2005

TO: Internal File

THRU: D. Wayne Hedberg, Permit Supervisor

THRU: Jim Smith, Hydrologist and Team Lead

FROM: Priscilla Burton, Environmental Scientist III, Soils

RE: Replacement of Volume 11 (RILDA Canyon Facilities), PacifiCorp, Deer Creek Mine, C/015/0018, Task ID #2266

SUMMARY:

This information concerning development of the Rilda Canyon surface facilities (for men and materials only) was received on May 31, 2005. This review explains how the amendment now meets the requirements of the Operations and Reclamation Topsoil/Subsoil and Experimental Practice requirements of the R645 Rules. Please refer to previous reviews of this amendment (Tasks 2032, 2093 and 2195) in which it was established that adequate information was provided for all other soil related sections.

The existing Rilda fan portals occupy 2.33 acres (v 1, chap 1, appendix E). The proposed North Rilda facilities will add 13.1 acres, bringing the total disturbed area for Rilda Canyon to 15.43 acres and for the Deer Creek Mine to 97.44 acres (Supplemental Volume, Appendix G). The total permit area remains unchanged at 22,013.77 acres.

Supplement Volume, Legal and Financial Information Appendix C (incorporated 4/21/2005) provides the following information for the Deer Creek Mine:

Total Federal Lease Acres	15,470.95
Total Private Fee Acres	1,020.00
Total State Lease Acres	5,522.82
Total	22,013.77

TECHNICAL ANALYSIS:

OPERATION PLAN

AIR POLLUTION CONTROL PLAN

Regulatory Reference: 30 CFR 784.26, 817.95; R645-301-244, -301-420.

Analysis:

The Deer Creek Mine operates under Air Quality Approval Order DAQE-AN0239002-02, issued on June 14, 2002. The Permittee has been in communication with Air Quality concerning a modification of the current AO due to the increase in size and equipment covered under the order.

Dust suppression at Rilda Canyon will be controlled with asphalt surfaces for major roadways and limited travel on unpaved service roads.

All disturbed surfaces and regraded areas will be seeded.

Findings:

The information provided in the application is adequate to meet the requirements of this section of the R645 Rules.

TOPSOIL AND SUBSOIL

Regulatory Reference: 30 CFR Sec. 817.22; R645-301-230.

Analysis:

Topsoil Removal and Storage

The plan describes removing the A and B horizon (to a maximum depth of 24 inches) in one step and salvaging this material as topsoil (Section R645-301-233). The Permittee will have a qualified person (familiar with the soil survey and salvage plan) on site to monitor the soil salvage operations (Section R645-301-231.100).

Map 200-1 illustrates the area of topsoil salvage and shows the 1.1-acre stockpile site. A three foot diameter culvert UC12 will be placed on the existing soil surface (Volume 11-

Appendix Volume- Hydrology Appendix B Table 8, and Map 700-2). Marker fabric will be used on 10 ft centers to denote the native soil beneath the stockpile. The topsoil stockpile is designed to hold approximately 25,000 cu yds with an average stockpile depth of 20 ft and slopes of 2h:1v (Map 500-4 Sheet 3 of 5, Section R645-301-231.100 and Section R645-301-234). As described in Section R645-301-234, the topsoil stockpile will be protected from erosion by surface roughness, a layer of grubbed brush, and with the sagebrush/grass seed mix described in Table 300-4 of R645-301-341. Silt fence will be installed at the toe of the stockpile and a fence will surround the stockpile to protect the vegetation from grazing animals (Section R645-301-231.400. After construction, the stockpile will be surveyed and the volume of topsoil stockpiled will be documented (Section R645-301-232).

Section R645-301-232 indicates 3,200 cu yds of buried A and B horizon could be encountered at the LeRoy Mine AML site beneath the coal mine waste buried in the location of the proposed sediment pond. These soils will be used to reclaim the sediment pond site and will be stored in the subsoil or topsoil stockpiles at the discretion of the qualified soil scientist (Section Plan for Experimental Practice. In. Section R645-302-218).

Construction of the facilities pad will require removal of subsoil to a depth of 35 ft (Map 500-4, Sections R645-301-234 and R645-301-521.150). The excess spoil will be stored as shown on Map 500-3 in a stockpile with dimensions 550 ft x 250 ft, having 2h:1v slopes and maximum heights of 70 ft (averaging 40 ft, Map 500-4 Sheet 4 of 5 provides the stockpile cross-sections). The subsoil storage area will occupy 3.0 acres, some of which is previously disturbed (Rominger Mine). The capacity of the subsoil storage area is 107,000 cu yds. Topsoil will not be salvaged from beneath the storage area. Stockpiling the surplus cut soils on topsoil is an Experimental Practice discussed under R645-302-210.

Findings:

Information provided meets the minimum topsoil and subsoil storage requirements of the Regulations.

RECLAMATION PLAN

TOPSOIL AND SUBSOIL

Regulatory Reference: 30 CFR Sec. 817.22; R645-301-240.

Analysis:

Redistribution

The Rilda Canyon sediment pond and portal facilities areas will be recontoured with subsoil, scarified and covered with topsoil dedicated to reclamation of the respective sites (R645-301-242 and R645-301-231.100).

Regraded subsoil will be sampled on 500 ft intervals to a depth of four feet as described in Section R645-301-231.300 (three or four samples for the 2,000 linear feet in the facilities area). The samples will be analyzed on site for pH and EC. Problem areas will be further sampled and sent to a laboratory for analysis.

When subsoil testing is complete and any problems are resolved, topsoil will be hauled to by dumptrucks and will then be redistributed by track-mounted equipment. Approximately 6.1 acres (excluding road and sediment pond) will receive 24 inches of stockpiled topsoil, depending upon actual recovery volumes (Section R645-301-242). Stakes will be used to monitor the replacement depth (Section R645-301-242). Three composite samples will be taken from the facilities area and sediment pond. Samples will be analyzed for parameters to be compared with baseline information and to determine the need for amendments, including fertilizer. Boulders will be replaced to provide 5% surface cover. The site will be gouged.

Topsoil storage sites and slopes less than 2h:1v in the subsoil storage area will be reclaimed with roughening of the surface as described (Section R645-301-242 and Item 5 of Plan for Experimental Practice In. R645-302-218). Subsoil storage area slopes greater than 2h:1v will receive an application of anionic polyacrylamide (PAM). (Some details of this application are described in Item 5 of Plan for Experimental Practice In. Section R645-302-218.) Boulders will be placed randomly to achieve 5% coverage. Seeding and root stock planting is described in Tables 300-7 and 300-8. Root stock will be treated with PAM before planting. Slopes greater than 20% will receive a tackifier (R645-301-243).

Reestablishment of microbial activity in stockpiled soil material usually occurs as a result of the addition of straw or hay and with seeding. The plan encourages rapid establishment of locally adapted strains of microbes through the use of a slurry of native soil and water (Vol. 11, Section R645-301-243).

Findings:

Information provided in the application meets the minimum requirements of the Regulations.

REQUIREMENTS FOR PERMITS FOR SPECIAL CATEGORIES OF MINING

EXPERIMENTAL PRACTICES MINING

Regulatory Reference: 30 CFR Sec. 785.13; R645-302-210, -302-211, -302-212, -302-213, -302-214, -302-215, -302-216, -302-217, -302-218.

Analysis:

Chapter 2, Soils, incorporates traditional methods of salvaging/stockpiling and an experimental practice method for protecting soils in-place. The Experimental Practice is unique by taking a reclamation approach to topsoil protection on steep slopes and over previously buried mine waste. In addition, the experimental practice includes 1) measurements of bulk density testing of the in-place soils before and after burial to advance understanding of the depth of compaction created by large stockpiles on surface soils and 2) treatment of slopes steeper than 2h:1v with anionic polyacrylamide to prevent erosion and encourage infiltration.

Operations - Experimental Practices

An Experimental Practice is described at the end of Chapter 2, Vol. 11 of the Deer Creek Mining and Reclamation Plan. Energy West Mining proposes a topsoil protection plan that incorporates Experimental Practices (R645-302-200) for in-place soil storage beneath a subsoil stockpile. The experimental practice will occur in Rominger Canyon where a subsoil pile with dimensions 550 ft long X 250 ft wide X 40 ft deep (on the average) will be constructed to hold 107,000 cu yds of subsoil and where boulder will be stored until use during reclamation (cross sections of the subsoil site are on Map 500-4 sheet 4 of 5).

The 3.0 acres experimental practice area will be covered with geotextile fabric. The fabric will provide a physical barrier between existing soil and the imported stored subsoil. The reclamation plan for in-place soil on slopes greater than 50% will include polyacrylamide (PAM). The PAM will enhance infiltration of water and stabilize soil aggregates to improve vegetation establishment and minimize erosion of the re-exposed, reclaimed slopes. By utilizing these procedures, the original ground surface configuration including cobbles, rocks, and soil cementation of the profile will be preserved in place. The experimental practice monitoring will provide an indication of the degree of compaction related to the loading of the in place soil through measurements of the bulk density of the in-place soil before and after burial.

Existing Soil Resources

The experimental practice will occupy 3.0 acres as shown on Maps 500-3. Within these 3.0 acres, there is an undisturbed area of 1.6 acres, where the topsoil layer is approximately four inches thick and lies on slopes as steep as 60°. The remainder of the 3.0 acres (1.4 acres) contains mine waste and was reclaimed in 1989 with an average of 18 inches of cover soil. A photo of the Rominger mine side canyon is provided in Volume 11-Appendix Volume – Engineering Appendix G.

The 1.6 acres of undisturbed soils on the slopes around the reclaimed Rominger disturbance is represented by soil sample site RC6 on Map 200-1 (Mt. Nebo Scientific Survey, Dec. 2004). The site description indicates that the soil is on a slope of 60% and has a 0-4 inch topsoil horizon, with a lithic contact at 34 inches. The soil was placed in the Great Group of Haplustepts and Ustorthents and is described as stony sandy loam (20% stones at the surface). [There are no prime farmlands in the vicinity.]

The 1.4 acres of disturbed soils in the Rominger side canyon are approximately eighteen inches deep over mixed coal/soil (AMR project report #AMR-015-904M). Sample S-8 is shown on Map 200-1, and a site description confirms 14 inches of topsoil over coal mixed with soil. The soils contain 20% gravels, 15% cobbles, 5% stones, and 5% coal fragments on the surface. The original soil surface was found buried under the coal at a depth of about 5 ft in AMEC pit 13 (discussed below). Disturbed soils of the reclaimed Rominger site were sampled for laboratory analysis by Jim Nyenhuis in December 2004 (site RC5, Volume 11-Appendix Volume Soils-Appendix B) to establish a baseline condition.

Disturbed soils were also investigated using both trenches and pits by AMEC Earth & Environmental Inc. in 2003 for geotechnical purposes. Test pits 13 and 14 shown on Map 200-1 fall within the Rominger mine location. The AMEC report is located in Vol 11. Appendix-Engineering, photographs accompanying this report are located in Vol 11. Appendix- Soils Appendix A. Photos of pits 13 and 14 represent the Rominger soils. Logs of these pits in Appendix A of the report indicate six inches topsoil cover over colluvium (and a foot of coal waste in pit 13 only). The original soil surface was found buried under the coal at a depth of about 5 ft. These pits were dug to depths of 13 and 15 feet.

Construction Sequence

Step 1.

Bulk density of the Rominger Mine soils will occur to a depth of 6 ft. prior to disturbance to provide baseline information on the native and reclaimed surface soils of Rominger Mine Canyon. The bulk density testing will follow an accepted agronomic procedure described in the following reference:

Soil Science Society of America. 1986. Series No. 9. Methods of Soil Analysis: Physical and Mineralogical Methods. Part 1. Second Edition. Arnold Klute, Ed.

Bulk density measurements will be taken again, after re-exposure of the topsoil, to provide an indication of the degree of compaction created by large stockpiles of soil.

Step 2.
Large vegetation will be removed and track equipment will be used to install 2 ft diameter culvert UC10 (Sections R645-301-231.100 and R645-301-231.400 and Volume 11-Appendix Volume- Hydrology Appendix B Table 8, and Map 700-2) to direct surface flows (originating from the watershed above Rominger Canyon) beneath the storage pile.

Step 3.
Geotextile fabric will be laid over the entire surface of the storage area.

Step 4.
The subsoil will be placed on top using track equipment.

Experimental Practices -Operational Monitoring

Ongoing monitoring

Section R645-302-218 indicates that the undisturbed bypass culvert inlet and outlet will be regularly monitored and maintained, as required by R645-301-742.312, to be stable and to provide protection against flooding, etc.

Prior to disturbance and Reclamation Monitoring

Bulk density of the existing soil surface to a depth of four feet (or lithic contact) prior to and after disturbance will be conducted to obtain information about the depth of compaction resulting from long term storage of soil. The important aspect of the bulk density testing is that the same procedure is used before and after disturbance. Monitoring will follow an agronomic method, such as listed in Soil Science Society of America. 1986. Series No. 9. Methods of Soil Analysis: Physical and Mineralogical Methods. Part 1. Second Edition. Arnold Klute, Ed., Chapter 13. The Permittee has developed a split-spoon method of determining density in large stockpiles that will be compared to the agronomic method. If initial tests determine the two methods are equivalent, then the split spoon method will be used to determine bulk density down to a depth of six feet prior to and after reclamation. And the method will be provided in written form as an attachment to the Experimental Practice.

Application of PAM to slopes greater than 50% (2h:1v) will be monitored for cover and erosion as described in item 6) Experimental Practice Monitoring, p. 37, Chap 2. The treated

slopes will be compared with monitoring of adjacent undisturbed areas to determine effectiveness of the PAM application in encouraging vegetation establishment and limiting erosion.

Reclamation - Experimental Practices

Slopes steeper than 50% (2h:1v)

At final reclamation, the stored construction fill soil will be removed to the depth geotextile fabric. Care will be taken not to subexcavate or disturb the native soil profile. Fill removal will be done by small earth moving equipment and/or by hand labor if necessary to minimize disturbance of the topsoil. After the pad fill has been removed, the backfilled culvert will serve as the primary access way for machinery and materials associated with the remaining reclamation efforts.

Subsoil fill will be removed down to the original, undisturbed surface as delineated by the marker strips. Because of the roughness of the ground surface, pad fill be removed to the extent possible. The condition of the underlying soil materials observed at this time. The soil will be re-exposed in 5-10 foot horizontal zones that can be easily accessed and worked by hand from the adjacent pad fill level.

Re-exposed soil of the reclaimed Rominger Mine site (lesser slopes) will be tested for nutrient status and bulk density.

Slopes steeper than 50% will be treated with an anionic polyacrylamide (PAM) during seeding to increase cohesion and infiltration of water without disrupting soil structure. Bareroot or containerized plant stock will be pre-treated with PAM and used as enhancement plantings on the re-exposed, steep slopes. The Division and Permittee assume that 20 years hence, advances will be made concerning the specifics of PAM application, consequently the plan indicates that details of the PAM application will be worked out prior to implementation.

For current information on the use of PAM:

http://kimberly.ars.usda.gov/pampage.shtml
http://esce.ucr.edu/soilwater/spring_2001.htm
http://www.hydrosource.com/clpbbs02.htm

Slopes less than 50% (2h:1v)

Slopes less than 2h:1v will be sampled for bulk density to a depth of four feet (Section R645-301-242) before and after soil burial. The effect of soil storage on underlying soils will be reported, increasing our understanding of the compaction created by large soil stockpiles.

To relieve soil compaction and increase the ability of the soil to absorb moisture, the re-exposed soils over reclaimed mine waste will be covered with 1 T/ac alfalfa hay mulch which will be worked into the soil with gouging. (Fertilizer will be added pending test results and comparison with baseline information.) Gouging will create a pattern of depressions that help control erosion through water retention, minimize siltation, and allow for air and water penetration into the soil horizon.

Excess boulders will be randomly placed to cover 5% of the surface. The seed mix described in Table 300-8 will be applied. PAM will not be applied to slopes less than 50%.

Analysis of the Proposed Experimental Practice

The soils regulations are intended to protect and preserve topsoil resources for the purpose of revegetation thus providing a stable surface capable of supporting the postmining land use. The proposed experimental practice, including operation and reclamation procedures, provides protection equal to or greater than what would be obtained through traditional methods required in the regulations. The Division has analyzed issues related to the proposed experimental practice, and the applicant has adequately addressed each of these concerns as follows:

1. **Compaction.** Pad fill material will compact the soil, but to what degree and what depth is unknown. Previous in-place experimental practices have assumed that below eighteen inches, there should be few effects of compaction from the fill. The applicant intends to measure the bulk density of the in-place soil before and after subsoil storage to gain some understanding of the depth of compaction with loading. Compaction will be monitored on slopes less than 2h:1v and will be relieved through gouging of the surface. This procedure, combined with natural processes (e.g., freeze/thaw), should adequately alleviate compaction and allow vegetation to become established. Compaction will be relieved on steep slopes because the entire soil profile of boulders, rocks, cobbles will remain in place and through the use of PAM which is reported to provide for infiltration of water which will encourage root growth.

2. **Decreased microbial activity.** Soil sterility is a problem whether soil is salvaged and stockpiled for years, or buried in place. Previous experimental practices have assumed that natural inoculation from adjacent undisturbed areas occurs over time. The Rominger Canyon Experimental Practice will enhance natural re-colonization by microorganisms with a supernatant from a slurry of soil and water that will be added to the hydroseeder. The soil in the slurry will be taken from adjacent undisturbed topsoil (Vol. 11, Section R645-301-243).

3. **Preserving configuration.** The experimental practice will not only allow preservation of soils in place, it will also preserve the configuration of boulders, cobbles, stones and cementation that provides structure, support and stability of the soils. This structure is difficult to duplicate in reclamation.

4. **Contamination.** Subsoils were sampled and analyzed during the soil survey (to a depth of six feet) and found to be non-toxic. It is unlikely that native soils would be contaminated by the imported subsoils, since subsoils will be placed against the native soils on a 60 ° slope and water will tend to drain downward into the subsoil fill. The in-place reclaimed mine waste at the bottom of the fill is not likely to be contacted by leachate from the subsoil as the depth of fill will average 40 feet and the average rainfall is 16 inches annually.

   Subsoils removed from the experimental practice area at final reclamation will be tested at the time of reclamation to determine whether extremes of pH or salts exist. Extreme values will provide an indication for remedial action of the subsoil (Vol 11, Section R645-301-231.300).

Findings:

The information provided meets the requirements for reclamation of the Experimental Practice. The Division finds that the requirements for approval of the Experimental practice are met and seeks the concurrence of the Office of Surface Mining in accordance with:

R645-302-214.100, the experimental practice encourages advances in coal mining and reclamation technology due to 1) information gained from bulk density testing of the existing surface soils prior to and after storage of the subsoil. 2) enhancement of reclamation technique on steep slopes through the use of anionic polyacrylamide (PAM).

R645-302-214.200, the experimental practice is potentially more, or at least as, environmentally protective, during and after coal mining reclamations, as would otherwise be required, because

1) Additional disturbance in the form of a larger topsoil storage area would be required for salvage and storage of the native soil and soil applied to cover the coal mining waste.
2) The undisturbed topsoil layer (0 – 4 inches) on the 60% slope of the undisturbed portion of the canyon will be covered the with geotextile to delineate and protect it in place from contamination and erosion. This soil would be difficult to salvage and more difficult to replace.

R645-302-214.300, The coal mining and reclamation operations are not larger than necessary to determine the effectiveness of the experimental practice: storage of subsoil will take place in a single side canyon, previously disturbed by mining and previously reclaimed by the Abandoned Mine Program. The use of the previously disturbed area allows evaluation of the experimental

practice of storing soils against steep, undisturbed slopes without creating additional disturbed lands.

R645-302-214.400, The experimental practice does not jeopardize the public health and safety. The soil will be placed, stored and removed in a stable manner. The application of PAM will be according to manufacturers directions. Details of application type and rate will be reviewed with the Division at reclamation.

RECOMMENDATIONS:

The application is recommended for approval at this time.

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